

**UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK**

JAMES CONTANT, *et al.*,

Plaintiffs,

v.

BANK OF AMERICA  
CORPORATION, *et al.*,

Defendants.

Case No. 17-cv-3139-LGS

(related to No. 13-cv-7789-LGS)

**DECLARATION OF JANET S. NETZ, PH.D. CONCERNING  
PROPOSED PLAN OF ALLOCATION OF SETTLEMENT FUNDS**

May 24, 2019

**DECLARATION OF JANET S. NETZ, PH.D.**

i of i

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I.	Qualifications .....	1
II.	Assignment .....	1
III.	Summary of allegations, theory of harm and damages.....	1
A.	Allegations .....	1
B.	Assumptions for the purpose of settlement allocation .....	2
C.	Expected impact .....	4
D.	Time period discount.....	5
IV.	Settlement allocation calculations.....	5
A.	Trading data.....	6
B.	USD trade volume .....	6
C.	Adjusted trade volume .....	6
D.	Discounted adjusted trade volume .....	6
E.	Claimant's total discounted adjusted trade volume.....	6
F.	Final allocation.....	6

## **I. Qualifications**

I, Janet S. Netz, am a founding partner of applEcon, LLC. I have been a tenured Associate Professor of Economics at Purdue University and a Visiting Associate Professor at the University of Michigan. I received a B.A. (1986) from the University of California, Berkeley, cum laude, and an M.A. (1990) and Ph.D. (1992) from the University of Michigan, all in Economics. My doctoral fields of study were Industrial Organization – the study of firm interaction and market performance – and International Trade and Finance. In my thesis I empirically examined the impact of financial instruments (futures contracts) on physical markets.

I have taught Industrial Organization at the undergraduate and doctoral level; Antitrust and Regulation at the undergraduate level; Microeconomic Theory at the undergraduate and master's level; and International Economics at the undergraduate level. My research has focused on competitive interactions of firms and strategies firms can use to increase profits as well as the resulting impact on firms and the market. I have published in peer-reviewed, scholarly journals and have presented my research at many conferences and seminars. I provide my academic employment and publication histories in my curriculum vitae, which is attached as Exhibit A.

I have testified at trial and by affidavit or declaration in matters related to antitrust, consumer protection, and business practices, especially with regard to the impact of anti-competitive conduct, for over fifteen years. In addition, I have consulted on numerous antitrust, consumer protection, and business practices cases. I provide a list of the cases on which I have testified and consulted in my curriculum vitae, which is attached as Exhibit A.

applEcon bills my work on this case at the rate of \$750 per hour. My and applEcon's compensation is not dependent on my opinions or the outcome of the case.

## **II. Assignment**

Plaintiffs' counsel have asked me to develop a method of allocating settlement funds in a manner that is proportional to the volume of each Class Member's transactions and the degree by which Class Member transactions were likely impacted by the alleged conspiracy under Plaintiffs' theory of harm.

All documents and data I have relied on are listed in Exhibit B. I reserve the right to revise my conclusions and opinions should more information come to light.

## **III. Summary of allegations, theory of harm and damages**

### **A. Allegations**

Plaintiffs allege Defendants shared competitively sensitive information and conspired to widen the bid-ask spreads on FX (foreign exchange) spot transactions in the over-the-counter (OTC) market in violation of various state antitrust and consumer protection laws.<sup>1</sup>

The bid-ask spread is the difference between the price at which a Defendant would buy a currency pair (the bid price) and that price at which it would sell the same currency pair (the ask

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<sup>1</sup> 28 November 2018, Second Consolidated Class Action Complaint, Contant et al. v. Bank of America Corporation, et al., No. 1:17-cv-03139-LGS (United States District Court for the Southern District of New York) (Hereinafter "Second Complaint"), at ¶¶115-118, 262-280.

price). Plaintiffs allege that Defendants' widening of the spreads simultaneously elevated the prices at which Defendants' counterparties purchased spot FX and depressed the prices at which their counterparties sold spot FX.<sup>2</sup>

Defendants' counterparties in the OTC market included retail foreign exchange dealers (RFEDs), which purchased spot FX instruments for resale to retail FX customers including Plaintiffs and members of the Classes.<sup>3</sup>

Plaintiffs further allege that RFEDs set their retail spot FX prices via pricing methods that automatically added a retail markup to the spread paid by the RFED to Defendants. The RFEDs therefore automatically and mechanically passed on the full amount of Defendants' collusive spread increase to their retail customers, including Plaintiffs and members of the Classes, in the form of increased retail bid-ask spreads.

Under Plaintiffs' theory of harm, when a Class Member purchased a currency pair via an RFED during the Class Period, they suffered harm equal to the total purchase price less the total purchase price they would have paid but-for Defendants' allegedly collusive conduct.

Likewise, when a Class Member sold a currency pair via an RFED during the Class Period, they suffered harm equal to the total sale price they would have received but-for Defendants' allegedly collusive conduct less the total sale price they actually received.

#### **B. Assumptions for the purpose of settlement allocation**

For the purpose of settlement allocation I assume Plaintiffs' allegations are true. Specifically, I assume that Defendants' conduct had the effect of widening the spreads of all currency pairs throughout the Class Period and that RFEDs fully passed through those anticompetitive price effects to their retail customers.

In addition, I make the simplifying assumption that Defendants' conduct had the effect of increasing the spreads for all currency pairs proportionally.

Different currency pairs typically trade at different spreads due in large part to differences in liquidity between currency pairs. For example, the USD/JPY (US Dollar/Japanese Yen) currency pair is widely understood to be very liquid and typically has small spread. Since January 2007 the spread for the USD/JPY has averaged 0.0198%.<sup>4</sup> See Exhibit 1. The GBP/NZD (British Pound/New Zealand Dollar), on the other hand, is an illiquid currency pair and typically has a larger spread. Since January 2007 the spread for the GBP/NZD has averaged 0.0673%.

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<sup>2</sup> All foreign exchange transactions necessarily involve the simultaneous purchase of one currency (the currency received) and the sale of another currency (the currency delivered). By convention, market participants refer to currency pairs in terms of the base currency and the quote currency. For example, the currency pair of the U.S. dollar and the Euro is referred to as the EUR/USD, with the base currency, the Euro, listed first. The exchange rate is denominated in the quote currency, e.g., EUR/USD exchange rates are quoted in terms of the USD. When a bank quotes a bid (ask) price, it is announcing the price at which it will buy (sell) the base currency in terms of the quote currency. For example, the bid price for the EUR/USD is the price in dollars at which the bank will buy Euros and sell U.S. dollars. The ask price for the EUR/USD is the price in dollars at which the bank will sell Euros and buy U.S. dollars.

<sup>3</sup> Second Complaint, at ¶3.

<sup>4</sup> I've expressed the spread as a percentage of the midpoint of the bid and ask. This facilitates the comparison of spreads across all currency pairs, including across FX rates that have different quote currencies. I use this convention throughout my declaration.

Exhibit 2 lists currency pairs by category:<sup>5</sup> most liquid, liquid, illiquid, and pegged.<sup>6</sup> Exhibit 1 calculates an average spread for a sample of currency pairs in each category.<sup>7</sup>

For the purpose of settlement allocation, I assume that Defendants increased the spread by a uniform percentage rate across all currency pairs.<sup>8</sup> This assumption is commonly used when quantifying the impact of anti-competitive conduct, including price-fixing, on the price of goods.<sup>9</sup>

For example, suppose that the Defendants' conduct had the effect of increasing the spread for all currency pairs by 10%, so the observed spreads in Exhibit 1 were 10% greater than they would have been in the but-for world. Then the average spread for the most liquid currency pairs would have been 0.0168% in the but-for world instead of the observed 0.0185% in Exhibit 1, an increase of 0.0017 percentage points. Under a 10% increase, the average spread for illiquid currency pairs would increase from 0.0523% in the but-for world to 0.0575% in the actual world, an increase of 0.0052 percentage points.

The impact to Class Members who transacted in illiquid currency pairs would thus be approximately 3.1 times greater than the impact to Class Members who transacted in the most

<sup>5</sup> For the purpose of this Declaration, I have adopted the currency-pair liquidity categories used in the Plan of Distribution in the Direct Purchaser Plaintiff case. 29 September 2017, Plan of Distribution, In re Foreign Exchange Benchmark Rates Antitrust Litigation, No. 1:13-cv-07789-LGS (United States District Court Southern District of New York).

<sup>6</sup> Pegged currencies are currencies whose value is fixed by the government with reference to another currency or group of currencies.

<sup>7</sup> My spread analysis uses bid and ask price tick data for 45 currency pairs, which I downloaded from HistData.com, a free online repository of historical foreign exchange data. I calculated weighted average spread percentages for each liquidity group using the April 2016 global average daily spot market turnover for each currency pair as weights, which I gathered from the Triennial Central Bank Survey conducted by the Bank for International Settlements and from an analysis of similar data provided by CLS Bank International. I, or a settlement plan administrator, may update these average spread calculations as more data become available. See,

- HistData.com, May 2019, Forex Tick Data, <https://www.histdata.com/download-free-forex-data/?/ascii/tick-data-quotes>, accessed 15 May 2019.
- Bank for International Settlements, 11 December 2016, Global foreign exchange market turnover in 2016, Triennial Central Bank Survey, [https://www.bis.org/publ/rpxfx16fxt\\_tables.xls](https://www.bis.org/publ/rpxfx16fxt_tables.xls), accessed 20 May 2019.
- Hasbrouck, Joel and Levich, Richard M., 15 February 2019, FX Liquidity and Market Metrics: New Results Using CLS Bank Settlement Data, <http://people.stern.nyu.edu/jhasbrou/Research/Hasbrouck-Levich%20v18.pdf>, accessed 20 May 2019, at pp. 50-51.

<sup>8</sup> I also assume that the spread was widened symmetrically, i.e., that the bid price decreased by the same amount that the ask price increased.

<sup>9</sup> See, e.g.,

- The authors describe the “dummy variable” model method of estimating overcharges and note that such an approach often estimates a uniform percentage overcharge. Finkelstein, Michael O. and Levenbach, Hans, 1983, Regression Estimates of Damages in Price-Fixing Cases, *Law and Contemporary Problems*, Vol. 46, No. 4, Statistical Inference in Litigation, 145-169, at pp. 155-156.
- The authors describe the “before-and-after” benchmark method to estimating antitrust overcharges, which implicitly employs calculating a uniform overcharge across products. Oxera and Komninos, Assimakis, December 2009, Quantifying Antitrust Damages: Towards Non-binding Guidance for Courts, Study prepared for the European Commission, at pp. 52-59.

liquid currency pairs, all else equal.<sup>10</sup> This ratio is in direct proportion the average spreads for illiquid and the most liquid currency pairs.<sup>11</sup> Regardless of the size by which the spread was widened by Defendants' conduct, the impact to Class Members who transacted in illiquid currency pairs would always be 3.1 times greater than those who transacted in the most liquid currency pairs. Using the figures in Exhibit 1, similar calculations can be made to estimate the impact of spread widening on Class Members who transacted in all currency-pair categories.

In other words, under the assumption of a uniform percentage increase in spreads across all currency pairs the impact of Defendants' spread widening on a given Class Member trade is proportional to the spread on the currency pair that Class Member traded.

At this point in the proceeding, I have not estimated the magnitude of the overcharge and it is not necessary to do so for the purpose of settlement allocation. Under the assumption that the spreads for all currency pairs increased by the same percentage, all Class Members would have suffered the same proportional impact regardless of the magnitude of the overcharge (that is, regardless of the magnitude by which the spread was widened). For example, suppose that a 10% increase in all spreads caused Class Member A to overpay by \$500 and Class Member B to overpay by \$1,000. If the spread instead had increased by 20%, then A would have overpaid by \$1,000 and B by \$2,000. In both cases, B overpaid by twice as much as A and both Class Members' share of the total overpayment does not depend on the size of the increase in the spread. Because settlement allocation involves allocation of a fixed amount of funds, only Class Members' shares of the total harm are relevant.

### C. Expected impact

Taken together, these assumptions imply that under the Plaintiffs' theory, the impact of Defendants' spread widening on any given trade that a Class Member made would be proportional to the volume of that trade multiplied by the spread at the time of the trade.

For example, suppose a Class Member entered four transactions, buying \$100,000 each of the most liquid, liquid, illiquid, and pegged currency pairs. The impact on that Class Member attributable to each of those trades is summarized in Table 1 below.<sup>12</sup>

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<sup>10</sup> Class Members who transacted in illiquid currency pairs would have paid a spread that was 0.0052 percentage points greater than they would have in the but-for world. Class Members who transacted in the most liquid currency pairs would have paid a spread that was 0.0017 percentage points greater than they would have in the but-for world. The degree to which trades in illiquid currency pairs were damages relative to the most liquid currency pairs is given by  $0.0052/0.0017 = 3.1$ .

<sup>11</sup> The average spreads for the most liquid and illiquid currency pairs are 0.0185% and 0.0575%, respectively.  $0.0575\%/0.0185\%$ , or 3.1.

<sup>12</sup> The impact attributable to each trade is equal to the price paid in the actual world less the price paid in the but-for world, i.e.,  $\$100,000 \times (\text{actual ask price}) - \$100,000 \times (\text{but-for ask price})$ .

Table 1: Overpayment Example					
Trade	Category	Actual spread	Spread increase	But-for spread	Overpayment
\$100,000	Most liquid	0.0185%	10%	0.0168%	\$0.84
\$100,000	Liquid	0.0351%	10%	0.0319%	\$1.60
\$100,000	Illiquid	0.0575%	10%	0.0523%	\$2.62
\$100,000	Pegged	0.0042%	10%	0.0038%	\$0.19

The wider spread caused the Class Member to overpay by \$2.62 for the illiquid currency pair, which is approximately 3.1 times the \$0.84 overpayment for the most liquid currency pair. The impact on the Class Member is in direct proportion to the actual spreads for the two currency pairs.<sup>13</sup>

Now suppose another Class member entered two transactions, one in which she sold \$100,000 of an illiquid currency pair and another in which she sold \$200,000 of an illiquid currency pair. The impact of those transactions is summarized in Table 2 below.

Table 2: Underpayment Example					
Trade	Category	Actual spread	Spread increase	But-for spread	Underpayment
\$100,000	Illiquid	0.0575%	10%	0.0523%	\$2.62
\$200,000	Illiquid	0.0575%	10%	0.0523%	\$5.23

The underpayment for the \$200,000 sale is twice as large as the underpayment for the \$100,000 sale. For each sale, the impact on the Class Member is in direct proportion to the volume of the transaction.

#### **D. Time period discount**

I understand that for the purpose of settlement allocation, Plaintiffs' counsel has proposed discounting the value of claims that took place after December 31, 2013, by 90%. This can be easily incorporated into the calculation of settlement amounts by multiplying the trade volume for any trades occurring after December 31, 2013, by 0.10.

### **IV. Settlement allocation calculations**

In this section, I outline a general method for allocating settlement funds to Claimants in proportion to the alleged impact of Defendants' anticompetitive conduct on spreads.

<sup>13</sup> 0.0575%/0.0185% = 3.1.

**A. Trading data**

The first step is to obtain trade volume data for each trade made by a Claimant. The trading data should include information concerning the currency pair, price, volume traded, and date. Historical trading records may be obtained from RFEDs or the Claimants themselves.

**B. USD trade volume**

The next step is to convert the trade volume into U.S. dollars using the relevant contemporaneous exchange rate.

**C. Adjusted trade volume**

The USD trade volume is then multiplied by the appropriate average spread in Exhibit 1 to obtain adjusted trade volume.

**D. Discounted adjusted trade volume**

For trades that took place on or after January 1, 2014, the adjusted trade volume is multiplied by 0.10.

**E. Claimant's total discounted adjusted trade volume**

For each Claimant, the discounted adjusted trade volume is summed across all the Claimant's trades. This results in the Claimant's total discounted adjusted trade volume.

**F. Final allocation**

Each Claimant's share of the settlement is proportional to their share of the total discounted adjusted trade volume across all Claimants.



I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief. This declaration was executed on the 24<sup>th</sup> day of May 2019, at Oakland, California.

A handwritten signature in black ink, appearing to read "Janet S. Netz", written over a horizontal line.

JANET S. NETZ



## Dr. Janet S. Netz

### Contact Information

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### Education

Ph.D. Economics, University of Michigan, 1992  
M.A. Economics, University of Michigan, 1990  
B.A. Economics, University of California at Berkeley, 1986, *cum laude*

### Employment

Founder and Partner, applEcon, May 2001 to present  
Visiting Associate Professor, University of Michigan, Fall 2001, Fall 2002, Fall 2003  
Associate Professor, Purdue University, Fall 2001 to January 2003  
Visiting Assistant Professor, University of Michigan, Winter 2001  
Assistant Professor, Purdue University, Fall 1994 to Spring 2001  
Assistant Professor, University of Delaware, Fall 1992 to Summer 1994

### Courses Taught

Industrial Organization (undergraduate and doctoral)  
Antitrust and Regulation (undergraduate)  
Intermediate Microeconomics (undergraduate and master's)  
Microeconomic Principles (undergraduate)  
International Economics (undergraduate and master's)

### Honors and Awards

Outstanding Antitrust Litigation Achievement in Economics, awarded by the American Antitrust Institute, for work in re TFT-LCD Antitrust Litigation, 2013.

Outstanding Economics Professor of the Year, Economics Club, Purdue University, 1999.

## **Publications**

"Are All Men's College Basketball Players Exploited?", with Erin Lane and Juan Nagel, *Journal of Sports Economics*, 15(3), June 2014, 237-262.

"Price Regulation: Theory and Performance", in *Regulation and Economics*, Roger J. Van den Bergh and Alessio M. Paccas, eds., Edward Elgar Publishing, 2011.

"Sports Trivia: A Review of The Economics of Intercollegiate Sports by Randy R. Grant, John Leadley, and Zenon Zygmunt", *Journal of Economic Literature*, 47(2), June 2009, 485-489.

"One-Way Standards as an Anti-Competitive Strategy", with Jeffrey K. MacKie-Mason, in *Standards and Public Policy*, Shane Greenstein and Victor Stango, eds., Cambridge Press, 2007.

"International Integration and Growth: A Further Investigation on Developing Countries", with Claire Economidou and Vivian Lei, *International Advances in Economic Research*, 12(4), November 2006, 435-448.

"Maximum or Minimum Differentiation? An Empirical Investigation into the Location of Firms", with Beck A. Taylor, *Review of Economics and Statistics*, 84(1), February 2002, 162-175.

"International Integration and Growth: A Survey and Empirical Investigation", with Vivian Lei and Jon D. Haveman, *Review of Development Economics*, 5(2), June 2001, 289-311.

"Price Regulation: A (Non-Technical) Overview", in *Encyclopedia of Law and Economics*, Boudewijn Bouckaert and Gerrit De Geest, eds, Edward Elgar and University of Ghent, 2000.

"Exercising Market Power in Proprietary Aftermarkets," with Severin Borenstein and Jeffrey K. MacKie-Mason, *Journal of Economic and Management Strategy*, 9(2), Summer 2000, 157-188.

"All in the Family: Family, Income, and Labor Force Attachment", with Jon D. Haveman, *Feminist Economics*, 5(3), November 1999, 85-106.

"Why Do All Flights Leave at 8am?: Competition and Departure-Time Differentiation in Airline Markets", with Severin Borenstein, *International Journal of Industrial Organization*, 17(5), July 1999, 611-640.

"An Empirical Test of the Effect of Basis Risk on Cash Market Positions", *Journal of Futures Markets*, 16(3), May 1996, 289-312.

"The Effect of Futures Markets and Corners on Storage and Spot Price Variability", *American Journal of Agricultural Economics*, 77(1), February 1995, 182-193.

"Antitrust Policy in Aftermarkets", with Severin Borenstein and Jeffrey K. MacKie-Mason, *Antitrust Law Journal*, 63(2), Winter 1995, 455-482.

"The Economics of Customer Lock-In and Market Power in Services", with Severin Borenstein and Jeffrey K. MacKie-Mason, in *The Service Productivity and Quality Challenge*, Patrick T. Harker, ed., Kluwer Academic, 1994.

## **Working Papers and Work in Progress**

"LCDs and Antitrust: Does Crime Pay?", with Nick Navitski and Josh Palmer

"Fantasy Football Points as a Measure of Performance", with Erin Lane and Juan Nagel

"Non-Profits and Price-Fixing: The Case of the Ivy League"

"The End of Collusion? Competition after Justice and the Ivy League and MIT Settle"

"Basis and Exchange Rate Risks and their Impact on Storage and Exports"

### **Research Grants**

"Product Customization and Product-Space Positioning", Dauch Center for the Management of Manufacturing Enterprises, Summer 2000.

"Trade Barriers, Trade Blocs, Growth, and Convergence", Purdue Research Foundation, 1998-1999.  
"Effects of Informational Asymmetry on Competition in the Residential Long Distance Calling Market", Purdue Research Foundation, 1997-1998.

"Basis and Exchange Rate Risks and their Impact on Storage and Exports", Center for International Business and Economic Research, Summer 1997.

Global Initiative Faculty Grant (Course Development), "Industrial Organization in an International Marketplace", Purdue University, Summer 1997.

"Trade, Not Aid", Purdue Research Foundation, Summer 1996.

"Trade, Not Aid", Center for International Business and Economic Research, Summer 1996.

"The Effect of Price-Fixing by Institutions of Higher Education", Purdue Research Foundation, Summer 1995.

"Applied Microeconomics/International Workshop", Purdue University, Spring 1995.

"The Market Structure of Higher Education", University of Delaware, Summer 1993.

Research Associate, Center for the Study of Futures Markets, Columbia University, 1991.

Rackham Merit Fellowship, University of Michigan, 1987-1989.

Chancellor's Scholar, University of California at Berkeley, 1983-1986.

### **Referee**

American Economic Review  
Contemporary Economic Policy  
Economics Bulletin  
Feminist Economics  
International Journal of the Economics of Business  
International Journal of Industrial Organization  
Journal of Economic Education  
Journal of Economic and Management Strategy  
Journal of Family and Economic Issues  
Journal of Futures Markets  
Journal of Industrial Economics  
Journal of Law and Economics  
Journal of Law, Economics, and Organization  
Management Science  
Review of Economics and Statistics  
Scandinavian Journal of Economics  
Telecommunications Systems

### Conference and Workshop Presentations

Panel participant, “*Apple v. Pepper*: SCOTUS Clarifies Application of *Illinois Brick*”, ABA Section of Antitrust Law, May 2019.

Panel participant, “Is ‘Direct’ Really Correct? Bricks, Tix, Kicks, and Apps after *Apple v. Pepper*”, ABA Section of Antitrust Law, Pricing Conduct and Civil Practice and Procedure Committees Program, October 2018.

Panel participant, “Will Apple’s App Store Lead to the end of *Illinois Brick*”, CLA Antitrust, UCL & Privacy Law Section and ABA Antitrust Section’s Global Private Litigation Committee program, San Francisco, CA, July 2018.

Guest lecturer, Antitrust Law, University of San Francisco Law School, April 2017 and 2018.

Panel participant, “The Challenge of Circumstantial Proof of Cartel Behavior and of Presenting Economic Issues and Concepts to Judges and Juries”, American Antitrust Institute, 10<sup>th</sup> Annual Private Enforcement Conference, Washington, DC, November 2016.

Panel participant, “Winning or Losing: Class Certification Post-Comcast”, American Bar Association, 62<sup>nd</sup> Antitrust Law Spring Meeting, Washington, DC, March 2014.

Panel participant, “Preparing Early and Often”, State-of-the-Art Strategies for Managing Class Action Experts, American Bar Association, 16<sup>th</sup> Annual National Institute on Class Actions, Chicago, IL, October 2012.

Panel participant, “Hot Topics Involving Experts in Antitrust Litigation”, New York State Bar Association, Antitrust Law Section, Annual Meeting, New York, NY, January 2011.

Guest lecturer, Alternative Dispute Resolution Practicum, University of Michigan Law School, April 2008.

“The Economics of Indirect Purchaser Cases”, State Bar of Arizona Annual Conference, Phoenix, AZ, June 2004.

“Manipulating Interface Standards as an Anti-Competitive Strategy”, Standards and Public Policy Conference, Federal Reserve Bank of Chicago, Chicago, IL, May 2004.

“One-Way Standards as an Anti-Competitive Strategy”, Telecommunications Policy Research Conference, Alexandria, VA, September 2002.

“Product Proliferation and Product Space Location”, Econometric Society Meetings, New Orleans, January 2001.

“The End of Collusion? Competition after Justice and the Ivy League and MIT Settle”, American Economics Association Meetings, New Orleans, January 2001.

“The End of Collusion? Competition after Justice and the Ivy League and MIT Settle”, Indiana University-Purdue University Indianapolis, November 2000.

“Maximum or Minimum Differentiation? An Empirical Investigation into the Location of Firms”, University of British Columbia, March 2000.

“Non-Profits and Price-Fixing: The Case of the Ivy League”, University of Illinois, October 1999.

“The End of Collusion? Competition after Justice and the Ivy League and MIT Settle”, Baylor University, September 1999.

"The End of Collusion? Competition after Justice and the Ivy League and MIT Settle", Western Economic Association Meetings, San Diego, July 1999.

"Non-Profits and Price-Fixing: The Case of the Ivy League", University of Chicago, April 1999.

"Non-Profits and Price-Fixing: The Case of the Ivy League", Indiana University, December 1998.

"International Integration and Growth: A Survey and Empirical Investigation", Dynamics, Economic Growth, and International Trade, III, Taiwan, August 1998.

Discussant ("Fiscal Policy and International Demand Spillovers"), Dynamics, Economic Growth, and International Trade, III, An International Conference, Taiwan, August 1998.

"International Integration and Growth", Workshop on Empirical Research in International Trade and Investment, Copenhagen, June 1998.

Discussant ("Factor Endowments and the Pattern of Affiliate Production by Multinational Enterprises," by Karolina Ekholm), Workshop on Empirical Research in International Trade and Investment, Copenhagen, June 1998.

"Non-Profits and Price-Fixing: The Case of the Ivy League", Department of Justice Antitrust Division, April 1998.

"Non-Profits and Price-Fixing: The Case of the Ivy League", American Economics Association Meetings, Chicago, January 1998.

Discussant ("Equilibrium under Satisficing," by Ralph W. Pfouts), International Atlantic Economics Society, ASSA Meetings, Chicago, January 1998.

Discussant ("Overseas Investments and Firm Exports," by Keith Head and John Ries), Fourth Annual Empirical Investigations in International Trade conference, Purdue University, November 1997.

"Maximum or Minimum Differentiation? An Empirical Investigation into the Location of Firms", International Atlantic Economic Association Conference, Philadelphia, October 1997.

Discussant ("Antidumping Enforcement in a Reciprocal Model of Dumping: Theory and Evidence," Taiji Furusawa and Thomas J. Prusa) and session chair, Third Annual Empirical Investigations in International Trade conference, Purdue University, November 1996.

"The Effect of Price-Fixing by Institutions of Higher Education", Indiana University-Purdue University Indianapolis, April 1996.

"Exercising Market Power in Proprietary Aftermarkets", with Severin Borenstein and Jeffrey K. MacKie-Mason, Indiana University - Purdue University - IUPUI First Tri-School Conference, March 1996.

"All in the Family: Family, Income, and Labor Force Attachment", with Jon D. Haveman, American Economic Association Meetings, San Francisco, January 1996.

"Family Matters: Unemployment, Wage Changes, and Mobility", with Jon D. Haveman, Southern Economics Association Meetings, New Orleans, November 1995.

Discussant and session chair, Second Annual Empirical Investigations in International Trade conference, Purdue University, November 1995.

“Competition and Anti-Competitive Behavior”, ICLE (The State Bar of Michigan) Conference on Antitrust and Intellectual Property, July 1995.

“Price-Fixing, Tuition, and Financial Aid”, Midwest Economics Association Meetings, Cincinnati, April 1995.

“Family Matters: Unemployment, Wage Changes, and Mobility,” Midwest Economics Association Meetings, Cincinnati, April 1995.

Discussant and session chair, “Customer Discrimination, Entrepreneurial Decisions, and Investment”, Midwest Economics Association Meetings, April 1995.

“An Empirical Test of the Effect of Basis Risk on Cash Market Positions”, University of Illinois, Urbana-Champaign, February 1995.

Discussant and session chair, First Annual Empirical Investigations in International Trade conference, Purdue University, November 1994.

“Antitrust Policy in Aftermarkets”, with Severin Borenstein and Jeffrey K. MacKie-Mason, FTC/DOJ/ABA Conference on Post-Chicago Economics, Washington, D.C., May 1994.

“The Effect of Price-Fixing by Institutions of Higher Education, University of Delaware, May 1994.

“The Effect of Futures Markets and Corners on Storage and Spot Price Variability”, Purdue University, February 1994.

“An Empirical Test of the Effect of Basis Risk on Cash Market Positions”, University of California at Davis, February 1993.

Discussant, Econometrics Association, Anaheim, 1992 Annual Meetings.

“Testing the Principle of Minimum Differentiation: Airline Departure-Time Crowding”, Econometrics Association, Washington, D.C., 1990 Annual Meetings.

### **Consulting and Testifying**

Contant v. Bank of America, 2019-  
*United States District Court, Southern District of New York*, No. 17-cv-3139-LGS  
Testifying expert for plaintiffs

Confidential client, 2019-  
Antitrust analysis regarding various cellular phone components

In re Malden Transportation, Inc. et al., v. Uber Technologies, Inc., 2018-  
*United States District Court, District of Massachusetts*, No. 1:16-cv-12538-NGM  
Testifying expert for plaintiffs

Confidential client, 2017-2018  
Antitrust analysis regarding various cellular phone components

In re Automotive Parts Antitrust Litigation

*United States District Court, Eastern District of Michigan Southern Division*, No. 2:12-cv-02311

Testifying expert for plaintiffs

- In re Occupant Safety Systems, No. 2:12-cv-00603, 2018-
- In re Heater Control Panels, No. 2:12-cv-00403, 2018-
- In re Anti-Vibrational Rubber Parts, No. 2:13-cv-00803-MOB-MKM, 2016-
- In re Bearings, No. 2:12-cv-00500, 2016-
- In re Automotive Wire Harness Systems Antitrust Litigation, No. 12-md-00101, 2012-
- In re Shock Absorbers Cases, No. 2:16-cv-0332, 2015-

Alarm Detection Systems, Inc. v. Orland Fire Protection District, et al., 2016-

*United States District Court, Northern District of Illinois*, No. 14-cv-00876

Testifying expert for plaintiff

Deposed May 2017

Testified at trial May 2017

In re LIBOR-Based Financial Instruments Antitrust Litigation, 2016-

*United States District Court, Southern District of New York*, No. 1:11-md-02262-NRB

Testifying expert for plaintiffs

Deposed March 2017, June 2017

Stacey Pierce-Nunes, on behalf of herself and all others similarly situated, v. Toshiba American Information Systems, 2015-

*United States District Court, Central District of California*, No. 3:14-CV-00796 JST

Testifying expert for plaintiffs

Deposed April 2016

John Moseley v. Toshiba America Information Systems, Inc., 2015-

Judicial Arbitration and Mediation Services No. 1200049482

Testifying expert for claimant

Deposed July 2015

In re Cathode Ray Tube (CRT) Antitrust Litigation, 2008-

*United States District Court, Northern District of California, San Francisco Division*, No. CV-07-5944-SC

Testifying expert for plaintiffs

Deposed November 2012, March 2013, June 2014, September 2014, October 2014

In re Photochromic Lens Antitrust Litigation, 2010-2012

*United States District Court Middle District of Florida, Tampa Division*, No. 8:10-md-02173-JDW-EAJ

Testifying expert for plaintiffs

Deposed August 2012

Datel Holdings and Datel Design and Development v. Microsoft, 2010-2011

*United States District Court, Northern District of California, San Francisco Division*, No. 09-cv-05535

Testifying expert for plaintiffs

Deposed October 2011

In re Prefilled Propane Tank Marketing and Sales Practices Litigation, 2010-2011

*United States District Court, Western District of Missouri, Western Division*, No. 4:09-cv-00465

Testifying expert for plaintiffs

In re Florida Cement and Concrete Antitrust Litigation, 2010

*United States District Court, Southern District of Florida, Miami Division*, No. 1:09-cv-23493-CMA

Consulting expert for plaintiffs



Altair Engineering v. MSC Software, 2009-2010

*United States District Court, Eastern District of Michigan, Southern Division*, No. 2:07-cv-12807

Testifying expert for plaintiff

Deposed May 2010

In re Optical Disk Drive products Antitrust Litigation, 2009-2010

*United States District Court, Northern District of California, San Francisco Division*, No. M:2010-cv-02143

Consulting expert for plaintiffs

In re Flash Memory Antitrust Litigation, 2008-2011

*United States District Court, Northern District of California, Oakland Division*, No. C-07-0086-SBA

Testifying expert for plaintiffs

Deposed August 2009

Valassis Communications, Inc. v. News America, Inc., 2008-2009

*United States District Court, Eastern District of Michigan, Southern Division*, No. 2:06-cv-10240

*Circuit Court of the State of Michigan, County of Wayne*, No. 07-0706645-CZ

Consulting expert for plaintiff

In re TFT-LCD (Flat Panel) Antitrust Litigation, 2008-present

*United States District Court, Northern District of California, San Francisco Division*, No. M:07-cv-01827

Testifying expert for plaintiffs

Deposed July 2009, June 2011, August 2011

Houston Baptist University v. NCAA, 2008-2009

*United States District Court in and for the Southern District of Texas, Houston Division*

Testifying expert for plaintiff

Seoul Semiconductor Co. v. Nichia Corp., 2008

*United States District Court, Northern District of California*, No. 3:08-cv-04932-PJH

Testifying expert for plaintiffs

Albert Andy Cohn v. Office Depot, 2008

*Superior Court of the State of California, County of Los Angeles, Central District*, No. BC 372449

Testifying expert for defendant

In re Graphics Processing Units Antitrust Litigation, 2007-2008

*United States District Court Northern District of California*, No. M:07-CV-01826-WHA

Testifying expert for plaintiffs

Deposed June 2008

Pro-Sys Consultants Ltd. and Neil Godfrey v. Microsoft, 2007-present

*Supreme Court of British Columbia*, No. L043175, *Vancouver Registry*

Testifying expert for plaintiffs

Deposed December 2008

In re Dynamic Random Access Memory (DRAM) Antitrust Litigation, 2007

*United States District Court, Northern District of California*, No. 02-cv-01486

Consulting expert for plaintiffs

Jason White et al. v. NCAA, 2006-2008

*United States District Court Central District of California*, No. CV 06-0999 RGK (MANx)

Testifying expert for plaintiffs

Deposed October 2007

In re Reformulated Gasoline (RFG) Antitrust and Patent Litigation, 2004-2008  
*United States District Court Central District of California*, No. 05-1671 CAS  
Testifying expert for plaintiffs  
Deposed December 2006

Carlisle, settlement negotiations with Crompton, EPDM price-fixing cartel, 2005-2007  
Consulting expert

Caterpillar and Carlisle, settlement negotiations with DuPont-Dow Elastomers, PCP (or CR) and EPDM price-fixing cartels, 2004-2005  
Consulting expert

City and County of San Francisco et al. v. Microsoft, 2004-2007  
*United States District Court for the District of Maryland*, No. 1332  
Testifying expert for plaintiffs

The Service Source v. Office Depot, 2004-2005  
*United States District Court Eastern District of Michigan Southern Division*, No. 02-73361  
Project director

Joe Comes et al. v. Microsoft, 2002-2008  
*Iowa District Court for Polk County*, No. CL82311  
Testifying expert for plaintiffs  
Deposed July 2006, November 2006

Charles Cox et al. v. Microsoft, 2002-2006  
*Supreme Court of the State of New York County of New York*, No. 105193/00  
Testifying expert for plaintiffs

Daniel Gordon et al. v. Microsoft, 2002-2004  
*State of Minnesota District Court County of Hennepin Fourth Judicial District*, No. 00-5994  
Testifying expert for plaintiffs  
Deposed September 2003

Morelock Enterprises, Inc. v. Weyerhaeuser Co., 2004-2008  
*United States District Court District of Oregon*, No. 3:04-cv-00583-PA  
Testifying expert for plaintiffs  
Deposed October 2004, April 2005, October 2007  
Testified in trial April 2008

Compuware v. IBM, 2002-2005  
*United States District Court for the Eastern District of Michigan*, No. 02-70906  
Project director

In re New Mexico Indirect Purchaser Microsoft Corp. Antitrust Litigation, 2002-2004  
*State of New Mexico First Judicial District*, No. D-0101-CV-2000-1697  
Testifying expert for plaintiffs

Charles Friedman et al. v. Microsoft, 2002-2004  
*Superior Court of the State of Arizona in and for the County of Maricopa*, No. CV2000-000722 / CV2000-005872  
Testifying expert for plaintiffs  
Deposed September 2003

In re Massachusetts Consumer Protection Litigation, 2003-2004  
*Commonwealth of Massachusetts, Superior Court Department of the Trial Court Middlesex Division*,  
No. 00-2456  
Consulting expert

Olson v. Microsoft, 2002  
*Montana First Judicial District Court Lewis & Clark County*, No. CDV-2000-219  
Consulting expert

Covad v. Bell Atlantic (Verizon), 2001-2004  
*United District Court for the District of Columbia*, No. 99-1046  
Project director

AMD, 2000-2004  
Project director

Leckrone, et al. v. Premark International, Inc., et al., 2001  
Testifying expert for plaintiffs

Ren, et al. v. EMI Music Distribution, Inc., 2001  
*State of Michigan in the Circuit Court of the County of Macomb*, No. 00-2383-CZ  
Testifying expert for plaintiffs

SBC, 2000  
Staff economist

Lingo et al. v. Microsoft, 1999-2004  
*Superior Court of the State of California City and County of San Francisco*, J.C.C.P. No. 4106  
Project director

Gravity et al. v. Microsoft, 1999-2003  
*United States District Court for the District of Columbia*, No. 1:99CV00363  
Staff economist

City and County of San Francisco, 1999  
Staff economist

Intergraph v. Intel, 1998-2001  
*United States District Court Appeals for the Federal District*, No. 98-1308  
Staff economist

Comm-Tract v. Northern Telecom, 1991-1997  
*United States District Court District of Massachusetts*, No. 90-13088-WF  
Project director

Systemcare, Inc. v. Wang Computer, 1991-1993  
*United States District Court for the District of Colorado*, No. 89-B-1778  
Staff economist

International Travel Arrangers v. Northwest Airlines, 1988-1989  
Staff economist

## **Exhibit B: Documents Relied Upon in the Declaration of Janet S. Netz**

28 November 2018, Second Consolidated Class Action Complaint, Contant et al. v. Bank of America Corporation, et al., No. 1:17-cv-03139-LGS (United States District Court for the Southern District of New York).

29 September 2017, Plan of Distribution, In re Foreign Exchange Benchmark Rates Antitrust Litigation, No. 1:13-cv-07789-LGS (United States District Court Southern District of New York).

Bank for International Settlements, 11 December 2016, Global foreign exchange market turnover in 2016, Triennial Central Bank Survey, [https://www.bis.org/publ/rpfxfl6fxt\\_tables.xls](https://www.bis.org/publ/rpfxfl6fxt_tables.xls), accessed 20 May 2019.

Finkelstein, Michael O. and Levenbach, Hans, 1983, Regression Estimates of Damages in Price-Fixing Cases, Law and Contemporary Problems, Vol. 46, No. 4, Statistical Inference in Litigation, 145-169.

Hasbrouck, Joel and Levich, Richard M., 15 February 2019, FX Liquidity and Market Metrics: New Results Using CLS Bank Settlement Data, <http://people.stern.nyu.edu/jhasbrou/Research/Hasbrouck-Levich%20v18.pdf>, accessed 20 May 2019.

HistData.com, May 2019, Forex Tick Data, <https://www.histdata.com/download-free-forex-data/?/ascii/tick-data-quotes>, accessed 15 May 2019.

Oxera and Komninos, Assimakis, December 2009, Quantifying Antitrust Damages: Towards Non-binding Guidance for Courts, Study prepared for the European Commission.

## Average Spreads by Currency Pair and Liquidity Group, 2007 to Present

Most Liquid	Spread	Liquid	Spread	Illiquid	Spread	Pegged	Spread
AUD/USD	0.0251%	AUD/CAD	0.0423%	EUR/HUF	0.0563%	EUR/DKK	0.0055%
EUR/CHF	0.0173%	AUD/CHF	0.0450%	EUR/NZD	0.0484%	USD/HKD	0.0040%
EUR/GBP	0.0244%	AUD/JPY	0.0416%	GBP/NZD	0.0673%	<b>Weighted Average</b>	<b>0.0042%</b>
EUR/JPY	0.0193%	AUD/NZD	0.0476%	NZD/CAD	0.0644%		
EUR/USD	0.0120%	CAD/CHF	0.0442%	NZD/CHF	0.0777%		
GBP/USD	0.0173%	CAD/JPY	0.0372%	NZD/JPY	0.0620%		
USD/CAD	0.0269%	CHF/JPY	0.0350%	USD/PLN	0.0508%		
USD/CHF	0.0265%	EUR/AUD	0.0312%	USD/ZAR	0.0526%		
USD/DKK	0.0111%	EUR/CAD	0.0328%	ZAR/JPY	0.2224%		
USD/JPY	0.0198%	EUR/NOK	0.0401%	<b>Weighted Average</b>	<b>0.0575%</b>		
USD/SGD	0.0242%	EUR/PLN	0.0421%				
<b>Weighted Average</b>	<b>0.0185%</b>	EUR/SEK	0.0322%				
		EUR/TRY	0.0479%				
		GBP/AUD	0.0342%				
		GBP/CAD	0.0351%				
		GBP/CHF	0.0333%				
		GBP/JPY	0.0304%				
		NZD/USD	0.0367%				
		SGD/JPY	0.0510%				
		USD/MXN	0.0218%				
		USD/NOK	0.0422%				
		USD/SEK	0.0359%				
		USD/TRY	0.0427%				
		<b>Weighted Average</b>	<b>0.0351%</b>				

Note(s): The Pegged currencies do not appear in the data until August 2008.

Data Source(s): HistData.com, May 2019, Forex Tick Data, <https://www.histdata.com/download-free-forex-data/?ascii/tick-data-quotes>, accessed 15 May 2019; Bank for International Settlements, 11 December 2016, Global foreign exchange market turnover in 2016, Triennial Central Bank Survey, [https://www.bis.org/publ/rpfx16fxt\\_tables.xls](https://www.bis.org/publ/rpfx16fxt_tables.xls), accessed 20 May 2019; Hasbrouck, Joel and Levich, Richard M., 15 February 2019, FX Liquidity and Market Metrics: New Results Using CLS Bank Settlement Data, <http://people.stern.nyu.edu/jhasbrou/Research/Hasbrouck-Levich%20v18.pdf>, accessed 20 May 2019, at p. 51.

Source File(s): spread\_analysis.do; spread\_analysis.xlsx

## Currency-Pair Liquidity Categories from Plan of Distribution in Direct Purchaser Plaintiff Case

Currency Pair	Liquidity	Currency Pair	Liquidity	Currency Pair	Liquidity
AED/CHF	Most Liquid	CAD/MXN	Liquid	TRY/RUB	Liquid
AUD/CNH	Most Liquid	CAD/RUB	Liquid	USD/INR	Liquid
AUD/HKD	Most Liquid	CAD/SGD	Liquid	USD/KZT	Liquid
AUD/USD	Most Liquid	CHF/JPY	Liquid	USD/MXN	Liquid
CAD/AED	Most Liquid	CHF/MXN	Liquid	USD/NOK	Liquid
CAD/CNH	Most Liquid	CHF/SGD	Liquid	USD/RUB	Liquid
CAD/HKD	Most Liquid	DKK/MXN	Liquid	USD/SEK	Liquid
CFH/CNH	Most Liquid	DKK/NOK	Liquid	USD/THB	Liquid
CHF/DKK	Most Liquid	DKK/SEK	Liquid	USD/TRY	Liquid
CNH/JPY	Most Liquid	EUR/AUD	Liquid	AUD/CZK	Illiquid
DKK/HKD	Most Liquid	EUR/CAD	Liquid	AUD/HUF	Illiquid
DKK/JPY	Most Liquid	EUR/HRK	Liquid	AUD/ILS	Illiquid
EUR/AED	Most Liquid	EUR/INR	Liquid	AUD/INR	Illiquid
EUR/CHF	Most Liquid	EUR/MXN	Liquid	AUD/NOK	Illiquid
EUR/CNH	Most Liquid	EUR/NOK	Liquid	AUD/PLN	Illiquid
EUR/GBP	Most Liquid	EUR/PLN	Liquid	AUD/RUB	Illiquid
EUR/HKD	Most Liquid	EUR/RON	Liquid	AUD/SEK	Illiquid
EUR/JPY	Most Liquid	EUR/RUB	Liquid	AUD/THB	Illiquid
EUR/USD	Most Liquid	EUR/SEK	Liquid	AUD/TRY	Illiquid
GBP/AED	Most Liquid	EUR/SGD	Liquid	AUD/ZAR	Illiquid
GBP/CNH	Most Liquid	EUR/TRY	Liquid	CAD/CZK	Illiquid
GBP/DKK	Most Liquid	GBP/AUD	Liquid	CAD/HUF	Illiquid
GBP/HKD	Most Liquid	GBP/CAD	Liquid	CAD/ILS	Illiquid
GBP/USD	Most Liquid	GBP/CHF	Liquid	CAD/INR	Illiquid
HKD/CHF	Most Liquid	GBP/JPY	Liquid	CAD/NOK	Illiquid
HKD/JPY	Most Liquid	GBP/MXN	Liquid	CAD/PLN	Illiquid
SGD/CNH	Most Liquid	GBP/SGD	Liquid	CAD/RON	Illiquid
SGD/HKD	Most Liquid	HKD/MXN	Liquid	CAD/SEK	Illiquid
USD/CAD	Most Liquid	HKD/RUB	Liquid	CAD/THB	Illiquid
USD/CHF	Most Liquid	HKD/SEK	Liquid	CAD/TRY	Illiquid
USD/DKK	Most Liquid	INR/JPY	Liquid	CAD/ZAR	Illiquid
USD/JPY	Most Liquid	JPY/TRY	Liquid	CHF/HUF	Illiquid
USD/SGD	Most Liquid	MXN/JPY	Liquid	CHF/ILS	Illiquid
AUD/CAD	Liquid	NOK/HKD	Liquid	CHF/INR	Illiquid
AUD/CHF	Liquid	NZD/HKD	Liquid	CHF/PLN	Illiquid
AUD/DKK	Liquid	NZD/USD	Liquid	CHF/RON	Illiquid
AUD/JPY	Liquid	PLN/DKK	Liquid	CHF/RUB	Illiquid
AUD/MXN	Liquid	SGD/DKK	Liquid	CHF/SEK	Illiquid
AUD/NZD	Liquid	SGD/JPY	Liquid	CZK/CHF	Illiquid
AUD/SGD	Liquid	SGD/MXN	Liquid	CZK/HUF	Illiquid
CAD/CHF	Liquid	TRY/DKK	Liquid	CZK/JPY	Illiquid
CAD/DKK	Liquid	TRY/GBP	Liquid	CZK/RON	Illiquid

Currency Pair	Liquidity	Currency Pair	Liquidity	Currency Pair	Liquidity
CAD/JPY	Liquid	TRY/HKD	Liquid	DKK/CZK	Illiquid
DKK/HUF	Illiquid	NOK/ILS	Illiquid	SGD/ILS	Illiquid
DKK/ILS	Illiquid	NOK/JPY	Illiquid	SGD/INR	Illiquid
DKK/THB	Illiquid	NOK/MXN	Illiquid	SGD/NOK	Illiquid
DKK/ZAR	Illiquid	NOK/RON	Illiquid	SGD/PLN	Illiquid
EUR/CZK	Illiquid	NOK/SEK	Illiquid	SGD/SEK	Illiquid
EUR/HUF	Illiquid	NZD/CAD	Illiquid	SGD/THB	Illiquid
EUR/ILS	Illiquid	NZD/CHF	Illiquid	SGD/ZAR	Illiquid
EUR/NZD	Illiquid	NZD/CZK	Illiquid	THB/CHF	Illiquid
EUR/THB	Illiquid	NZD/DKK	Illiquid	THB/JPY	Illiquid
EUR/ZAR	Illiquid	NZD/HUF	Illiquid	TRY/CHF	Illiquid
GBP/CZK	Illiquid	NZD/ILS	Illiquid	TRY/CZK	Illiquid
GBP/HRK	Illiquid	NZD/JPY	Illiquid	TRY/HUF	Illiquid
GBP/HUF	Illiquid	NZD/MXN	Illiquid	TRY/ILS	Illiquid
GBP/ILS	Illiquid	NZD/NOK	Illiquid	TRY/NOK	Illiquid
GBP/INR	Illiquid	NZD/PLN	Illiquid	TRY/PLN	Illiquid
GBP/NOK	Illiquid	NZD/RUB	Illiquid	TRY/SEK	Illiquid
GBP/NZD	Illiquid	NZD/SEK	Illiquid	TRY/ZAR	Illiquid
GBP/PLN	Illiquid	NZD/SGD	Illiquid	USD/CZK	Illiquid
GBP/RON	Illiquid	NZD/THB	Illiquid	USD/HRK	Illiquid
GBP/RUB	Illiquid	NZD/TRY	Illiquid	USD/HUF	Illiquid
GBP/SEK	Illiquid	NZD/ZAR	Illiquid	USD/ILS	Illiquid
GBP/THB	Illiquid	PLN/CZK	Illiquid	USD/PLN	Illiquid
GBP/ZAR	Illiquid	PLN/HKD	Illiquid	USD/RON	Illiquid
HKD/CZK	Illiquid	PLN/HUF	Illiquid	USD/ZAR	Illiquid
HKD/HUF	Illiquid	PLN/ILS	Illiquid	ZAR/CHF	Illiquid
HKD/ILS	Illiquid	PLN/JPY	Illiquid	ZAR/CZK	Illiquid
HRK/CHF	Illiquid	PLN/NOK	Illiquid	ZAR/HKD	Illiquid
HRK/CZK	Illiquid	PLN/RON	Illiquid	ZAR/HUF	Illiquid
HRK/RON	Illiquid	PLN/THB	Illiquid	ZARJPY	Illiquid
HUF/RON	Illiquid	RON/JPY	Illiquid	ZAR/MXN	Illiquid
ILS/HUF	Illiquid	RON/SEK	Illiquid	ZAR/NOK	Illiquid
ILS/JPY	Illiquid	RUB/CZK	Illiquid	ZAR/PLN	Illiquid
ILS/MXN	Illiquid	RUB/JPY	Illiquid	ZAR/SEK	Illiquid
ILS/SEK	Illiquid	RUB/SEK	Illiquid	AED/HKD	Pegged
ILS/ZAR	Illiquid	RUB/ZAR	Illiquid	AED/USD	Pegged
INR/SEK	Illiquid	SEK/CZK	Illiquid	ANG/USD	Pegged
JPY/HUF	Illiquid	SEK/HUF	Illiquid	AWG/USD	Pegged
MXN/HUF	Illiquid	SEK/JPY	Illiquid	BAM/EUR	Pegged
MXN/PLN	Illiquid	SEK/MXN	Illiquid	BBD/USD	Pegged
MXN/TRY	Illiquid	SEK/PLN	Illiquid	BGL/EUR	Pegged
NOK/CHF	Illiquid	SEK/THB	Illiquid	BHD/USD	Pegged
NOK/CZK	Illiquid	SGD/CZK	Illiquid	BMD/USD	Pegged
NOK/HUF	Illiquid	SGD/HUF	Illiquid	BND/USD	Pegged

Currency Pair	Liquidity	Currency Pair	Liquidity
BSD/USD	Pegged	SZL/ZAR	Pegged
BTN/INR	Pegged	TMT/USD	Pegged
BZD/USD	Pegged	USD/AED	Pegged
CNH/USD	Pegged	USD/AED	Pegged
CUP/USD	Pegged	USD/ANG	Pegged
CVE/EUR	Pegged	USD/AWG	Pegged
DJF/USD	Pegged	USD/BBD	Pegged
DKK/EUR	Pegged	USD/BHD	Pegged
ERN/USD	Pegged	USD/BMD	Pegged
EUR/BAM	Pegged	USD/BND	Pegged
EUR/BGL	Pegged	USD/BSD	Pegged
EUR/CVE	Pegged	USD/BZD	Pegged
EUR/DKK	Pegged	USD/CNH	Pegged
EUR/KMF	Pegged	USD/CUP	Pegged
EUR/STD	Pegged	USD/DJF	Pegged
EUR/XAF	Pegged	USD/ERN	Pegged
EUR/XOF	Pegged	USD/HKD	Pegged
EUR/XPF	Pegged	USD/JOD	Pegged
FKP/GBP	Pegged	USD/KWD	Pegged
GBP/FKP	Pegged	USD/LBP	Pegged
GBP/GIP	Pegged	USD/MVR	Pegged
GBP/SHP	Pegged	USD/OMR	Pegged
GIP/GBP	Pegged	USD/PAB	Pegged
HKD/CNH	Pegged	USD/QAR	Pegged
HKD/MOP	Pegged	USD/SAR	Pegged
HKD/USD	Pegged	USD/SSP	Pegged
INR/BTN	Pegged	USD/TMT	Pegged
INR/NPR	Pegged	USD/VEB	Pegged
JOD/USD	Pegged	USD/VEF	Pegged
KMF/EUR	Pegged	USD/XCD	Pegged
KWD/USD	Pegged	VEB/USD	Pegged
LBP/USD	Pegged	VEF/USD	Pegged
MOP/HKD	Pegged	XAF/EUR	Pegged
MVR/USD	Pegged	XCD/USD	Pegged
NAD/ZAR	Pegged	XOF/EUR	Pegged
NPR/INR	Pegged	XPF/EUR	Pegged
OMR/USD	Pegged	ZAR/LSL	Pegged
PAB/USD	Pegged	ZAR/NAD	Pegged
QAR/USD	Pegged	ZAR/SZL	Pegged
SAR/USD	Pegged		
SHP/GBP	Pegged		
SSP/USD	Pegged		
STD/EUR	Pegged		

Data Source: 29 September 2017, Plan of Distribution, In re Foreign Exchange Benchmark Rates Antitrust Litigation, No. 1:13-cv-07789-LGS (United States District Court Southern District of New York).